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Are Leftness and Rightness Rightly Left in the Syntax?: A Preliminary Study*

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ABSTRACT. This paper reviews various linguistic phenomena which have been captured with reference to linear order, i.e. left, right, or left/right. This should be taken as a first step of a larger project which explores the role of linear order in the human language faculty.

Keywords: linear order, syntax-phonology interface, Sensorimotor efficiency hypothesis

1. Introduction

This paper is the initial part of an ongoing project which explores the role of linear order in human language faculty: in particular, whether it plays a role or not in syntactic computation, and if it does, how. As a first step, I would like to list previously proposed principles or constraints which refer to linear order, i.e. left or right, and examine what implications they might make for the architecture of the human language faculty, in particular, syntax-phonology interface.

2. Linear order in the previous (syntactic) studies

2.1. Leftness

First, let us look at conditions or phenomena which refer to "leftness": (i) left branch condition, and (ii) the leftness condition, which rules out sentences with strong or weak crossover.

Ross (1967, 1986) proposes the left branch condition defined as (1).

(1) Left branch condition (Ross 1967, 1986:127)
No Noun Phrase on the left branch of another Noun Phrase may be extracted from that Noun Phrase.

The left branch condition is later extended to rule out the extraction of determiners or adjectival phrases, and hence the examples in (2) are all ruled out by the condition.

(2) a. *Whose$_i$ did you see [t_i father]?
b. *Which$_i$ did you buy [t_i car]?
c. *That$_i$ he saw [t_i car].
d. *Beautiful$_i$ he saw [t_i houses].
e. *How much$_i$ did he earn [t_i money]?

The leftness condition is defined as in (3), and it rules out the weak crossover sentence in (4a) as well as the strong crossover sentence in (5a).

(3) The Leftness Condition (Chomsky 1976)
A variable cannot be the antecedent of a pronoun to its left.

(4) Weak Crossover (Wasow 1972)
a. *Who$_i$ did his$_i$ mother offend t_i?

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b. Who$_i$ offended his$_i$ mother?

(5) Strong Crossover (Postal 1971)
a. *Who$_i$ did he$_i$ say Sandy likes t_i best?
b. Who$_i$ said he$_i$ likes Sandy best?

It has been observed that weak crossover is normally more tolerable than strong crossover (hence it is given the name "weak"), but the leftness condition would rule out both in the same way.

2.2. Rightness

Let us turn to constraints or rules which refer to "rightness": (i) the condition on rightward movement, (ii) right node raising and right-edge restriction, and (iii) right-hand head rule.

So called rightward movement is known to behave differently from leftward movement, and the condition on rightward movement in (6) is proposed as a condition that specifically applies to rightward movement.

(6) Condition on rightward movement (Ross 1967)
In all rules whose structural index is of the form ... A Y, and whose structural change specifies that A is to be adjoined to the right of Y, A must command Y.
(cf. The notion of "command" here is not as strict as c-command: it goes up to the first S.)

The condition on rightward movement is widely known as "Right Roof Constraint," the name of which is due to Soames and Perlmutter (1979). This condition, for example, rules out the extraposition from NP sentence in (7b) where the PP *of this article* is extracted out of the subject clause.

(7) a. [That [a review t_i] came out yesterday [of this article]$_i$] is catastrophic.
b. *[That [a review t_i] came out yesterday] is catastrophic [of this article]$_i$.
(Ross 1967:166)

Later, Baltin (1981) tries to unify the conditions on leftward and rightward movement by generalizing the subjacency condition as in (8).

(8) Generalized Subjacency (Baltin 1981:262)
In the configuration A . . . [$_\alpha$ . . . [$_\beta$ . . . B . . .] . . .] . . . A' :
A and B cannot be related where α and β _ one of NP, PP, and either or both of S and S'; A' and B cannot be related where α and β are both maximal projections of any major category.

However, we immediately notice that the generalized subjacency condition in (8) still distinguishes between leftward and rightward movement in terms of A vs. A' in the configuration.

Next, there is a construction called right node raising, which is pointed out by Postal (1974), illustrated by the examples in (9).

(9) a. Earnest suspected t_i, Louise believed t_i, and Michael proved t_i – [that she was guilty]$_i$.
b. She may have t_i and should have t_i – [defrosted the roast]$_i$.
c. They know when t_i but they don't know where t_i – [he abused the dog]$_i$.
d. Eloise peeled t_i and Frank ate t_i raw – [the large Spanish onion]$_i$.

Postal says that "[the] term *right node raising* (RNR) is an *atheoretical* designation for the phenomenon (not for any type of rule or characterization of it) illustrated in [(9)]" (Postal

1998:97).

It seems that right node raising is subject to its own condition, and Bachrach and Katzir (2009:308), based on Sabbagh (2007), propose the following restriction on right node raising, which also refers to "rightness."

(10) Right-Edge Restriction (RER)
  a. The RN or a gap associated with it must be rightmost within each conjunct.
  b. The RN cannot surface in a non-rightmost conjunct.

The restrictions in (10a), (10b) are meant to rule out the ill-formed sentences such as (11a), (11b), respectively.

(11) a. *John should [give t_i the book] and [congratulate t_i] that girl.
  b. *[Joss will donate t_i to the library today], and [Maria will donate [several old novels]$_i$ to the library tomorrow].
  (Bachrach and Katzir 2009:308-309, citing Wilder 1999:595 and Sabbagh 2007:47)

Finally, a famous rule referring to rightness is found in the area of morpho-syntax.

(12) Right-hand Head Rule (Williams 1981:248)
  In morphology, we define the head of a morphologically complex word to be the right-hand member of that word.

The right-hand head rule in (12) captures the fact that the syntactic categories of the complex words such as those in (13) are determined by their suffixes, despite the fact that English is syntactically left headed.

(13) a. [$_N$ [left] [$_N$ ness]]
  b. [$_{Adv}$ [right] [$_{Adv}$ ward]]

2.3. 'Left or right' ness

When we talk about the position of head, it is almost unavoidable to refer to either leftness or rightness. The directionality of head is captured in syntactic terms, for example, by head parameter (Chomsky 1981), directionality of government, Case assignment, or theta assignment (Koopman 1984, Travis 1984), or a general licensing principle (Haider 1992). For example, English is a representative of a head-initial language whereas Japanese is a representative of a head-final language, and Fukui (1993) stipulates that English and Japanese have the rules (14a) and (14b) respectively in the verbal domain.

(14) a. English: $V^0 > Y^{max}$
  b. Japanese: $Y^{max} > V^0$ (Fukui 1993:402)

2.4. Linearization

If we assume syntactic structures of any kind, the structures need to be translated into left-to-right linear order in order to be pronounced.

3. Leftness and rightness in the human language faculty

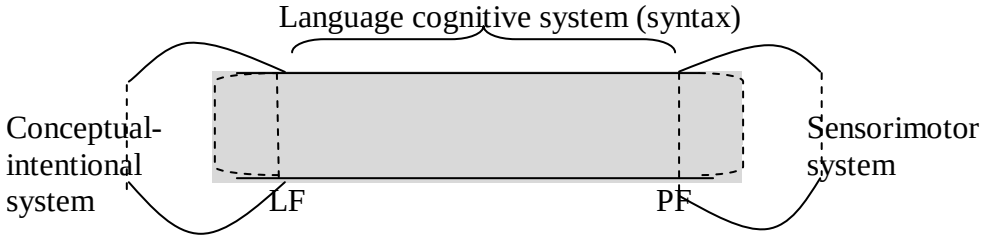
3.1. Architecture of the language faculty

Before getting into the discussion of where in the language faculty linear order plays a role, it is necessary to make it clear what kind of assumptions we make regarding the architecture of the language faculty.

First, we can reasonably assume that the cognitive system of the language faculty (or what I call "syntax" here) interfaces with two performance systems: Conceptual-intentional (CI) system and Sensorimotor (SM) system. The interface of the former is called Logical

Form (LF), and the latter, Phonetic Form (PF). In addition, I assume here that "[p]erformance systems are presumably at least in part language-specific, hence components of the language faculty" (Chomsky 1995:2). This early minimalist view of the language faculty is depicted as in (15):

(15) Early Minimalist view of the language faculty (shaded part, Chomsky 1995, as interpreted in Fukui 2001:106, 2012:81, see also Tokizaki 2011a:224)



The research question is whether leftness or rightness plays any role in the language faculty, specifically in the syntax, or not. My speculative answer is "no" in the syntax, but "yes" in the language-specific performance systems (cf. section 4.1). Before elaborating on this speculation, let us look at some representative previous approaches to linear order.

3.2. Syntactic approaches to linearization (regarding 2.3 and 2.4)

Kayne (1994) proposes the Linear Correspondence Axiom (LCA), which derives specifier-head-complement order (or complement-head-specifier order) as the universal order which is base-generated in the syntax. The other orders are derived via syntactic movement. Kayne (1994:38) notes that "[this] S-H-C property of UG, as well as the fact that UG does not make both orders available, is […] seen to be ultimately related to *the asymmetry of time*" (emphasis mine).

Chomsky (1995:334-340) adopts LCA but restates it in phonological terms: "We take the LCA to be a principle of the phonological component that applies to the output of Morphology, optionally ignoring or deleting traces" (Chomsky 1995:340).

On the other hand, revival of head parameter is found in Saito and Fukui (1998), which, contra Chomsky (1995), argues that the Merge operation should incorporate head parameter. That is to say, English builds up structure from bottom up in a head-initial way whereas Japanese does so in a head-final way.

In this connection, the theory of Dynamic Syntax (Kempson et al. 2001) proposes that the grammar directly provides an architecture for incremental left-to-right language processing. Similarly, Phillips' (1996, 2003) Parser Is Grammar (PIG) view, which does not employ the traditional division of labor between the grammar and the parser, dictates that phrase structures are built from left to right in the order in which lexical items are pronounced. I adopted this view in analyzing English and Japanese structures (Shiobara 2004, 2010).

3.3. Linearization and the PF interface (regarding 2.2, 2.3 and 2.4)

Alternatively, linearization can be taken to be a phonological phenomenon. For example, Rochemont (1978) proposes stylistic rules, a predecessor of phonological movement, and argues that stylistic rules are post-syntactic movement operations in the phonological component (and yet contribute to pragmatic representations). In the same line, Zubizarreta (1998) proposes prosodically-motivated movement (p-movement), which applies in the syntax, but has an impact on LF. We should note, however, that both Rochemont and Zubizarreta assume different architectures of language faculty from (15).

At any rate, the syntax-phonology interface is a hot area of linguistic research. Some work

related to my research interest includes, but not is limited to: Dobashi (2003), Wagner (2005), Anttila (2008), Tokizaki (2008, 2011b).

3.4. Discourse processing based approach to leftness (regarding 2.1)

Culicover (2013), based on Heim (1982) and in lines with e.g. Erteschik-Shir (2007) and Kluender (1998), suggests that a relevant factor in determining the well-formedness of weak crossover is the linear order in which the elements appear. He argues that "[referential] dependencies are computed in real time on the basis of the discourse structure" (Culicover 2013:138). Regarding Weak Crossover (WCO) that we saw in 2.1, Culicover argues that "[in] some cases, such as WCO, I suggest that linear order is sufficient to account for the acceptability judgments" (Culicover 2013:139, see also Shan and Barker 2006).

3.5. Processing based approach to linearization (regarding 2.1, 2.2, 2.3 and 2.4)

In his seminal work, Hawkins (1990, 1994, 2004, 2014) argues that major word order patterns of variation across languages are structured by general principles of efficiency in language use and communication. Evidence for these comes from languages permitting structural options from which selections are made in performance. The preferences and performance within languages are reflected, he shows, in the fixed conventions and variation patterns across grammars, leading to a "Performance-Grammar Correspondence Hypothesis" (Hawkins 2014).

3.6. Summary

Although different approaches look at different linguistic phenomena, seminal work by Hawkins, which affects some work presented above, seems to cover the widest range of empirical facts both within a particular language and across languages, and in this sense, can be seen as the most adequate both descriptively and explanatorily. In the rest of the paper, I will explore the way how Hawkins' processing based approach can be appropriately situated in the architecture of the language faculty depicted in (15).

4. Speculations and domains to explore

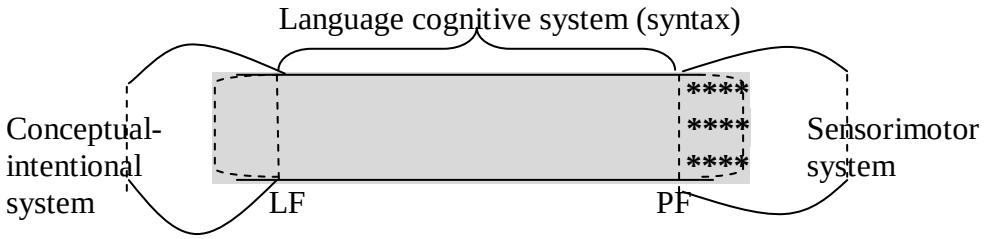
4.1. Sensorimotor (SM) efficiency hypothesis

First of all, I adopt the Strong Minimalist Thesis (SMT) (Chomsky 1998) as a Null Hypothesis: Language is an optimal solution to legibility conditions. In more concrete terms, I follow Hawkins (see 3.5) in assuming that leftness and rightness are governed by general principles of efficiency. I depart from Hawkins, however, in assuming that *prosodic objects* (e.g. intonation domain and its edges, prosodic prominence), rather than syntactic ones (e.g. words and phrases) play a direct role in evaluating efficiency.[1] This idea is formulated as Sensorimotor (SM) efficiency hypothesis in (16):

(16) Sensorimotor (SM) efficiency hypothesis
When a linguistic phenomenon refers to linear order in its formulation, it applies in the language-particular Sensorimotor system (indicated by * in (15') below).

[1] I leave out the communication part of Hawkins' approach.

(15')



If the hypothesis (16) fails in accounting for a linguistic phenomenon, we need to search for another explanation of it, preferably in the following order: in terms of (i) other principles of performance systems, (ii) PF or LF interfaces that have access to syntax, or (iii) syntax proper. In order to explore which linear phenomena belong to which part of the language faculty, I would like to examine (i) typological facts, (ii) violation of syntactic constraints, and (iii) the nature of conditions on syntax-phonology interface. We will look at them in turn.

4.2. Properties to examine and domains to explore in order to test the SM efficiency hypothesis

4.2.1. Typological (prosodic) facts

If a relevant phenomenon involving linear order in a language does not hold cross-linguistically, the SM efficiency hypothesis (16) leads us to purser the possibility of attributing it to the general prosodic property of the language.

As for the Left branch condition, for example, Ross (1967, 1986) notes that Latin and most Slavic languages (SC, Russian, Polish, Czech, but not Macedonian and Bulgarian, see Boškobić 2005) allow left branch extraction. The question, then, is whether this fact can be characterized in terms of the prosodic properties of these languages or not. See Shiobara (2016) for ongoing work on this.

Works are now abundant which try to reduce head directionality to other factors. Hawkins (1993) argues that the notion "head" can be dispensed with altogether, as a property of Universal Grammar, saying that the underlying generalization involves a principle of parsing: the relevant categories provide unique "Mother Node Construction" (Hawkins 1993:231). Tokizaki (2011b) provides an intriguing phonologically based analysis of the headedness in morphology and syntax. Furthermore, phonological bootstrapping in language acquisition (Morgan and Demuth 1996), and a prosodically based analysis of diachronic change in word order (Taylor 2005) are also relevant in this connection.

4.2.2. Violation of syntactic constraints

If the relevant phenomenon shows some sort of gradience, the SM efficiency hypothesis (16) leads us to purse the possibility of attributing it to the gradient nature of prosodic prominence.[2]

Rightward movement is an interesting domain to look at in this respect. Notably, the condition on rightward movement (or more precisely, Generalized Subjacency, see 2.2) can be violated. For example in (17), the relative clause is extraposed from an NP which is embedded in another NP:

(17) [The names of [all the painters t_i]] are unknown [whose work is being exhibited in the Chicago Art Institute next week]$_i$. (Stucky 1987:391)

It is also shown that the acceptability of extraposition from NP is affected by various factors,

[2] But see Aarts (2007) for general discussion on how to formalize gradience in grammar.

including the type of host NPs.

(18) a. I read a book during the vacation [which was written by Chomsky].
b. *I read that book during the vacation [which was written by Chomsky].
(Guéron and May 1984:6)

In addition, extraposition from NP is less restricted than leftward movement in that it is not subject to Condition on Extraction Domain (Cattel 1976, Huang 1982). In (17) above, for example, the relative clause is extracted out of subject, but it does not lead to ungrammaticality of the sentence.

Right node raising can also violate the condition on rightward movement, and applies to morphemes as well.

(19) a. [John met the man who wrote _], and [Mary met the woman who published _] the recent bestseller about bats. (Bachrach and Katzir 2009: 283)
b. [His theory under- _], and [her theory over- _] generates.
(Bachrach and Katzir 2009:287, citing Sabbagh 2007)

(20) [Mary buys t_i] and [Bill knows a man who sells t_i]– [pictures of Elvis Presley]$_i$.
(Postal 1998:102))

Heavy NP shift can also violate the condition on rightward movement, particularly when the NP is "heavy," and shows the difference in acceptability depending on the relative weight of the shifted NP (Hawkins 1994, 2004, Zec and Inkelas 1995, Akasaka and Tateishi 2001, Shiobara 2001, 2004, 2010). With regard to gradient nature of acceptability, I have been looking at extraposition from NP, heavy NP shift, scrambling, preposition-stranding and swiping, VP-internal idioms, and interwoven dependency constructions (Shiobara 2001, 2004, 2009, 2010, 2011a,b, 2015), and am almost certain that (at least parts of) these properties of rightness should be characterized in terms of the prosodic properties of the languages.

4.2.3. Generalization of conditions on syntax and phonology

Another question posed by the SM efficiency hypothesis (16) is whether an apparent syntactic condition can be reanalyzed as an instantiation of a more general principle of SM Efficiency. "Distinctness" by Richards (2010) or "the avoidance of identity" (Yip 1998) is relevant to this point in the following sense: "Ultimately, we may want a unified O[bligatory] C[oncour] P[rinciple] for both phonology and syntax; assuming that phonological representations also involve linearization statements (Raimy 2000), then a version of the account developed here might be generalized to phonology" (Richards 2010:207, fn.1). (See also Nasukawa and Riemsdijk eds. 2014, in particular, Yip 2014.)

In addition, a "phase," has been reanalyzed in phonological terms. Chomsky (2007: 107-108) mentions PF isolability of phases, and Shiobara (2004, 2010) provides prosodically based approach to phases. Sato (2009) and Dobashi (2003, 2006) are also important in this respect.[3]

5. Summary

This paper reviewed linguistic phenomena or conditions that refer to linear order and some previous analyses of them. I proposed the Sensorimotor efficiency hypothesis in (16) and made suggestions as to what to look at to test the hypothesis, hoping that research in this line should tell us whether the hypothesis is valid or not.

[3] But see Boškobić (2002:182, fn.18) and Boeckx and Grohmann (2007:215) for the view against PF isolability of phases.

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